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LEGISLATION FOR THE CREATION OF A STATE GEOGRAPHIC INFORMATION DATABASE IN UTAH

The Utah Automated Geographic Reference Center (AGRC) was established in 1981 with a mission to encourage and facilitate implementation of GIS technology in Utah and to develop and direct this process in state government. Geographic Information Systems Data Sharing and Conformity (Senate bill 21) was passed during the 1991 Utah Legislative session to: (1) create the State Geographic Information Database (SGID); and (2) create AGRC by statute to provide GIS services and manage the SGID. The SGID will: (a) serve as the central reference source for all information contained in any GIS database by any state agency; (b) serve as a clearinghouse and repository for all data layers required by multiple users; and (c) serve as a standard format for geographic information acquired, purchased, or produced by any state agency. This paper will discuss the background of GIS and database efforts in Utah, the events leading up to the drafting of the GIS bill, and perceived impacts and benefits of the bill on the GIS and database efforts in Utah.

BACKGROUND

In Utah, the notion of a central state geographic information database has been around for almost 15 years. In May of 1977, Governor Scott Matheson requested a study be done to develop recommendations for a centralized database management system. At that time, an inter-agency committee was formed to determine statistical and geographic data needs of each agency. The needs were documented in a data dictionary completed in November of 1978. This committee also established a set of goals and objectives emphasizing the need for a geographic data base to be used for resource management, planning, and inter-agency coordination. GIS pilot projects and existing departmental functions during 1979 and 1980 reinforced the need for a statewide Geographic Database.

In 1980, Environmental Systems Research Institute (ESRI) was hired as a

consultant to assist with a plan for GIS implementation in the state. ESRI developed a report that recommended a centralized computer facility to serve all State agency's GIS needs. Part of this function would include the development of a statewide database that "would provide for a standardized approach for data format, uniformity of scale and compatibility of data elements"(4,pg.4-6). A contract was signed in May of 1981 between the State of Utah and ESRI for the purchase of hardware, software (consisting of GRID, PIOS, TOPO, Automap II, and digitizing software), and training. Installation took place in June of that year. With this new equipment, the State set out to create and maintain a state-wide database.

Late in 1981, several tasks that needed to be achieved were identified. These included creation of a state-wide catalog of existing and desired data, automated support for this catalog, capability of capturing additional data, and addition of a geographic component to existing data. It was recognized at this time that an Automated Geographical Referencing System was needed for implementation of these tasks (10). Early in 1982, the Automated Geographic Reference (AGR) was established in the Department of Natural Resources (DNR). Here AGR focused on natural resource issues only. In 1983, a GIS steering committee was created to assess the utility of GIS in State government. This committee identified three actions deemed necessary for the effective implementation of GIS technology in state government: the formation of a single, functional GIS work unit; the purchase of state-of-the-art hardware and software; and the relocation of AGR to Capitol Hill.

As a result, in 1984, AGR purchased ARC/INFO on a PRIME minicomputer and entered the modern age. Staff from the Governor's Office of Planning and Budget (OPB), the Division of Data Processing (DDP), and DNR joined forces to create the AGR Taskforce, which had a new focus on statewide issues. One of the first projects completed as a Taskforce was the analysis and mapping project for site visibility for the proposed nuclear waste repository near Canyonlands National Park in southern Utah. The AGR Taskforce won the "Most Analytical Award" at the ESRI Users Conference in 1985 for this effort.

Also in 1984, Price-Waterhouse was contracted by the State to prepare a "Strategic Approach" for implementation of GIS in Utah. Their recommendations included successful completion of project work as a means to promote AGR and create data for subsequent uses; provide additional support and training for the user community; and develop the database architecture and standards. They also stressed the inappropriateness of a decentralized database because of high cost, the risk of incompatible data sets, and problems this would create for state planning efforts (11). Once more the State was being pushed to create a state-wide geographic database.

By the mid-1980s, the AGR Taskforce employed several individuals with backgrounds in GIS, automated mapping, traditional cartography, and data processing. There was sufficient interest as well as the ability to create the state-wide geographic database people had been talking about for almost ten years. The AGR Taskforce was reorganized under OPB in 1986, however, and placed most of its emphasis on sales of service. In this move, AGR lost much

of its legislative appropriation and had to depend on contract project work for revenue generation.

With the emphasis on making money for cost recovery, very little time was available for database creation. However, efforts were made to continue database development and not abandon the process entirely. A database team was created from the existing staff with regular meetings to examine a number of issues. These included user's needs, assessing AGR's database responsibilities, defining alternative designs, identifying database administration duties, and preparing documentation on standards. Although not all ideas were implemented, the AGR staff developed some innovative approaches to database design and implementation. This effort laid the ground work for later development.

In 1989, the AGR Center(AGRC) was created in the Department of Administrative Services, Division of Information Technology Services, thereby moving the staff one more time. In this change, AGRC lost all legislative funding and became a total "cost-recovery" agency. This change brought new priorities for the AGRC staff. First among these was the completion of the State Geographic Information Database (SGID). In 1990, AGRC entered a contract with OPB for $80,000 to assist in this effort. In less than a year, with this money and a significant effort by AGRC, the SGID infrastructure was complete. The SGID consists of four parts; the database itself, a menu driven query interface, a set of software tools for database administration, and a published SGID Users Guide. The Users Guide was distributed to all state, federal, and local agencies involved with GIS, and provides an off-line data dictionary and catalog along with instructions for using the menu query system and ordering data. This Users Guide is also a first attempt to inventory all data available from other GIS sites in the state.

GEOGRAPHIC INFORMATION SYSTEMS DATA SHARING AND CONFORMITY BILL

Origin

The Utah State Legislature became involved with geographic information systems in the mid-1980's as a result of U.S. Census Bureau plans to map each state's voting districts based on geographic features. The Census Bureau in 1985 provided maps and requested each state to redraw all voting districts to conform with identifiable geographic features such as rivers, ridge lines, and roads. The maps would eventually be released in the digital TIGER Line format and integrated with the data collected in the 1990 census. The major reason for the Census Bureau mapping project was to make it possible for states to use computer-driven systems for redistricting and reapportionment after the 1990 census.

The Utah Legislature, in response to the Census Bureau, requested an analysis of the project by the Office of Legislative Research and General Counsel. Based on the recommendation of the director, the Legislature decided to participate in the mapping project with the Census Bureau and selected

ARC/INFO as the software to manipulate the data for redistricting.

Parallel to the redistricting process, the Legislature in the late 1980's and early 1990's was also pursuing legislation on natural hazards such as earthquakes. The 1990 General Legislative Session produced seven bills on earthquake hazards and safety. None of the bills passed, but they resulted in the mandate for an interim study on natural hazards, which in turn led to the recognition of the capabilities of GIS for managing natural hazards data.

Evolution of the Bill

During the interim committee period following the 1990 general session, the mandate for a study of natural hazards translated into the assignment of the topic to the State and Local Affairs Interim Committee. The topic of natural hazards was then researched extensively by the staff of the Office of Legislative Research and General Counsel. This research resulted in a list of options that highlighted the need for GIS data and capabilities. Over the course of multiple committee meetings and presentations by legislative staff and the staff of the AGRC, it became clear that geographic based data provided the best source of information for natural hazard preparedness and response.

As a result, a subcommittee was formed to look exclusively at the issue of information processing using GIS type systems. The subcommittee hearings which then took place focused on the establishment of GIS databases and the statutory creation of an executive branch entity to set policies and manage the databases. The subcommittee also considered some related data processing issues which would enhance information processing efficiency. Finally, the subcommittee reviewed the need for a Telecommunications Task Force which would study issues related to the processing of all types of electronic information.

Following the subcommittee hearings, draft legislation on GIS systems and databases was proposed and sent to all thirty-six executive branch departments for comment. Remarkably, only one department, Agriculture, voiced concerns over the implementation of a statewide GIS system and database. Their chief issue was that of money. How much was it going to cost the Department of Agriculture? That question was addressed in following subcommittee meetings and the Department of Agriculture subsequently endorsed the proposed legislation.

The legislative process

Once an idea has been conceived, studied in the interim committee period, and the proposed legislation drafted, the final test of an idea's merit begins. The draft legislation is numbered and introduced into the state's legislative process for debate, amending, and final approval or disapproval on the respective floors of the house and senate.

The procedure for a bill to become law is relatively straightforward. After the draft legislation is numbered and introduced in either the house or senate, it is sent to the rules committee which assigns the bill to one of the standing committees for debate. Assignment to a standing committee is usually based on the bill's topic. The standing committee will then hold public meetings where any interested party may speak for or against the bill. Following the debate, the committee may either pass the bill out favorably, hold the bill, or return it to the rules committee. If the bill is passed out favorably, it returns to the legislative body where it was introduced for debate on the floor. This process takes place in both the house and senate.

Providing a bill has passed all the constitutional requirements (13), it is then sent to the governor for his signature or veto. This is the last pressure point where proposed legislation can be supported or opposed by legislators and lobbyists. It is also the point where a person tracking a bill should be able to describe the arguments both pro and con for any piece of legislation and relate why it did or did not become law.

Senate Bill 21, (Geographic Information Systems Data Sharing and Conformity) received strong support throughout the legislative process. It passed unanimously in the house and senate standing committees and on the floor of the house and senate. The bill was signed into law by Governor Norman Bangerter on March 20, 1991.

WHAT THE BILL DOES

The bill creates the State Geographic Information Database (SGID) and the Automated Geographic Reference Center (AGRC) by statute. The center shall: (a) provide geographic information system services to state agencies under rules and policies...; (b) provide geographic information services to federal government, local political subdivisions, and private persons under rules and policies...; (c) manage the State Geographic Information Database; and (d) establish standard format, lineage, and other requirements for the database. The database shall: (a) serve as the central reference for all information contained in any GIS database by any state agency; (b) serve as a clearing house and repository for all data layers required by multiple users; and (c) serve as a standard format for geographic information acquired, purchased, or produced by any state agency. Each state agency that acquires, purchases, or produces digital geographic information data shall: (a) inform the center of the existence of the data layers and their geographic extent; (b) allow the center access to all data classified public; and (c) comply with any data base requirements established by the center. (14)

Benefits of the Bill

Jonathan Gottsegen (5) notes the importance of establishing stability for a GIS in order to survive in changing political and administrative climates. A major benefit of the bill will be to create a buffer for AGRC and the SGID

from political and administrative uncertainties. In effect, the bill doesn't significantly change the role of AGRC but creates some permanency and visibility for the GIS and database efforts in Utah.

The benefits of a centrally managed data base are well documented. (3; 6; 7) For the data user the "data clearing house" or "one stop shopping" scenario provides easy access, increased awareness, and greater availability of geographic data. Costs for individual projects can also be cut significantly by making commonly used data layers available to more users. Centralized management will also ensure data integrity and consistency, and enable decisions to be made based on the same data set. Database administration and data acquisition costs can also be significantly decreased. The reduction of redundant data layers saves disk storage space as well as reduces the duplication of data generation efforts. A common data base will also help identify information inadequacies, and thereby help determine priorities for future data acquisition and development.

There are also significant intangible benefits of a centralized GIS and database. The development and use of a central database by multiple agencies can provide the mechanism for interchange between different resource professions and promote a team work approach to problem solving and application development. The hierarchical organizational structure of many organizations does not promote lateral links between resource professionals. (1; 12) An established GIS with a shared database can promote those links. This is evident with the recent memorandum of understanding to create the Utah Soils Digital Database (USD) within the SGID. The USD represents a landmark effort among the major state and federal agencies in Utah that develop and use soil survey data. It provides the framework for establishing standards and procedures for contributing to and accessing data in the USD. The USD will be used as a model for initiating cooperative efforts for other data layers, including archeology, wetlands and a public land survey grid.

The provision in the bill for providing GIS services to government and private sector enterprises will increase the availability of GIS technology in general. One time applications, such as the supercollider study undertaken in 1986, can be accommodated without the expense of a GIS procurement, allowing access to a GIS where the costs would otherwise be prohibitive. The development of custom interfaces and turn-key applications can readily put the technology of the existing GIS and database in the hands of the decision maker as well as streamline the implementation of GIS into an organization's operation. As a part of the GIS services offered, training conducted at AGRC assists users in developing and implementing GIS within their organizations, increases efficiency in accessing the SGID, and generally provides an increase in the knowledge base of GIS capabilities.

Implementation issues

Since the release of SGID the database has received unified support throughout participating state agencies. It appears that cooperation and compliance with provisions of the bill will come naturally for the most part. Perkins (9)

notes that unified organization can help build a constituency to facilitate change in reluctant organizations. The benefits of cooperating with and having access to the data base will probably also outweigh any reluctance to cooperate due to turf issues.

AGRC is using a team approach to develop standards, which are then subject to review and approval by the Information Technology Review Committee (ITRC). ITRC is comprised of data processing managers from all major executive branch departments. The team work approach to developing standards along with the ITRC review facilitates the involvement of all interested parties in formulating data layer specifications. This helps promote the involvement of agencies responsible for developing and maintaining data layers as well as providing reliable information to the data user. AGRC is currently forming a technical committee to develop standards for a wetlands data layer in the SGID. By involving local and federal agencies in addition to state agencies, it is hoped that a unified effort will be made to consolidate existing data bases, develop standards for future efforts to reduce redundancy, and generate a database that will be of use to the greatest number of people.

If informal means of creating cooperation and compliance do not work, more formal means may be necessary. This might involve limiting access to the database for non-compliant agencies, or the use of legislative performance audits of an agency.

A basic key to the success of a centralized GIS and database is stable funding sources (5). Since AGRC is now a cost recovery agency, funding will be a critical element of the future success of the data base. Funding for the SGID involves two components, data acquisition/maintenance and database administration. Funding for data acquisition and maintenance will be borne mostly by cooperating agencies. Data acquisition is primarily from three sources: agency contributions; cooperative efforts among agencies; and data developed for specific projects. Maintenance of the data layers is primarily conducted by the agency responsible for the data layer.

Funding for database administration is estimated at $60,000 per year, and will probably come from a variety of sources. Direct legislative appropriation to AGRC is a possible source but unlikely due to AGRC's cost recovery status. Another possibility is dedicated revenue from participating agencies through annual subscription fees or direct user access fees. It is also anticipated that money will be available from the state GIS Coordinator's budget for database administration.

Looking to the future

The role of GIS in coordinating and integrating existing information systems is increasing dramatically, from acting as the "great integrator" of a variety of data sources (2) to providing a graphic front end to huge corporate data bases (8). AGRC is in the process of creating live links between the GIS and the volumes of existing data on the state's mainframe computer. A recent tie

was made between AGRC's GIS to the Division of State Lands and Forestry's lease information data base on the main frame computer.

The development of standards within the SGID will significantly enhance the increasing access to relational data bases statewide, which in turn will increase agency productivity capabilities. Once rates are finalized for use of the SGID, an opportunity may exist for agencies to recover some of their data acquisition costs. Efforts in creating increased access to the SGID through expansion of network capabilities will also contribute to a standardized communication network in the state.

The centralized GIS and database in Utah have also significantly increased the public's access to geographic information by providing a mechanism for reporting data availability and for disseminating data. The bill will ensure the stability of these efforts and potentially contribute to increased public access. Through the coordination of GIS services and database development, it may be possible in this decade for a person to access massive quantities of data and the power of GIS technology from a remote terminal at their local library. A menu driven graphical front end could provide this service to the user with no technical background and minimal training.

CONCLUSIONS

The GIS and database efforts during the last decade in Utah contributed significantly to the inception and adoption of Senate Bill 21. Having a GIS in place with concrete examples of the benefits was an important aspect of creating an awareness within the legislature of the benefits of GIS. This awareness was also fostered by having identified two significant issues in the state, redistricting and earthquake preparedness, that are important to the public and the legislature, and that can be addressed with a GIS.

Senate Bill 21 doesn't significantly change the role or responsibilities of AGRC. It will, however, give AGRC permanency in state government and the authority to develop cooperative efforts for GIS implementation and database development within state agencies. It also provides exposure for AGRC and the SGID, which in turn enhances the ability to foster cooperative efforts between multiple levels of government for database and application development.

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